CLAIMS

What is claimed is:

1. A packaged electronic device, comprising:

an electronic device; and

a housing enclosing the electronic device, the housing comprising a base and a cover,

wherein the base is affixed to the cover by a weld joint to form a first hermetic seal;

wherein the electronic device is supported on the base; and

wherein the cover includes an aperture, and a hydrogen diffusion port joined to the aperture by a low temperature joining operation to form a second hermetic seal in the cover.

2. The packaged electronic device of claim 1 wherein the hydrogen diffusion port is joined to the aperture by application of a solder between the port and the cover.

3. The packaged electronic device of claim 1 wherein the hydrogen diffusion port is joined to the aperture by swaging.

4. The packaged electronic device of claim 1 further including an intermediate metal having an intermediate aperture, the intermediate metal positioned between the cover aperture and the hydrogen diffusion port, wherein the hydrogen diffusion port is swaged into the intermediated aperture of the intermediate metal and the intermediate metal is joined to the cover aperture by application of a solder.

5. The packaged electronic device of claim 1 wherein the hydrogen diffusion port is a material selected from the group consisting of palladium, platinum, titanium and their alloys.

6. The packaged electronic device of claim 2 wherein the hydrogen diffusion port is joined to the cover by application of a solder compatible with the cover and the hydrogen diffusion port.

7. The packaged electronic device of claim 2 wherein the base is a material having a coefficient of thermal expansion compatible with the electronic device so that the differential thermal expansion between the electronic device and the base will not adversely affect the operation of the electronic device.

8. The packaged electronic device of claim 7 wherein the base is selected from the group of materials consisting of iron-nickel alloys and iron-nickel-cobalt alloys.

9. The packaged electronics device of claim 7 wherein the cover is selected from the group of materials consisting of aluminum, iron-nickel alloys and iron-nickel-cobalt alloys.

10. The packaged electronic device of claim 9 wherein the hydrogen diffusion port is joined to the aperture by a solder selected from the group consisting of lead/tin; gold/germanium, and gold/tin.

11. The packaged electronic device of claim 1 wherein the cover comprises an aluminum-based material.

12. The packaged electronic device of claim 11 wherein the base comprises an aluminum-based material.

13. The packaged electronic device of claim 11 wherein the cover further includes a layer of the base material bonded to the cover at the interface with the base.

14. The packaged electronic device of claim 11 wherein the base further includes a layer of aluminum-based material bonded to the base at an interface with the cover.

15. The packaged electronic device of claim 4 wherein the intermediate metal comprises a material having substantially the same composition as the cover.

16. A packaged electronic device, comprising:

an electronic device; and

a housing enclosing the electronic device, the housing comprising a base, and a cover selected from the group of materials consisting of titanium and its alloys,

the cover having an inner surface and an outer surface, the inner surface and the outer surface coated with a material selected from the group consisting of Au, Pd and combinations thereof, selected to prevent the formation of titanium oxide, the coated cover forming a hydrogen diffusion port.

wherein the base is affixed to the cover by a weld joint to form a hermetic seal;

wherein the electronic device is supported on the base.

17. The packaged electronic device of claim 16 wherein the base comprises a non-titanium material having a coefficient of thermal expansion compatible with the electronic device so that the differential thermal expansion between the electronic device and the base will not adversely affect the operation of the electronic device.

18. The packaged electronic device of claim 17 wherein the base further includes a layer of titanium-based material bonded to the base at an interface with the cover.

19. The packaged electronic device of claim 17 wherein the cover further includes a layer of the base material bonded to the cover at the interface with the base.

20. A method for manufacturing a reduced-hydrogen packaged electronic device that includes a hydrogen port, comprising the steps of

providing an electronic device;

providing a base;

affixing the electronic device to the base;

providing a cover, the cover including an aperture;

welding the cover to the base to form a housing;

degassing the assembly by heating to a temperature in the range of about 100-265° C for a time sufficient to remove at least some hydrogen from the housing; then

providing a hydrogen diffusion port for the aperture, the hydrogen diffusion port sized to be received by the aperture; and

soldering the hydrogen diffusion port to the aperture to form a hermetically sealed solder joint, wherein the housing is characterized by an absence of plating applied to the base, the cover and the solder joint.

21. The method of claim 20 wherein the step of providing a cover having the aperture includes providing a cover comprising aluminum.

22. The method of claim 20 wherein the step of providing a hydrogen diffusion port includes providing a hydrogen diffusion port selected from the group of materials consisting of palladium and palladium alloys, platinum and platinum alloys and titanium and titanium alloys.

23. A method for manufacturing a packaged electronic device comprising the steps of:

providing an electronic device;

providing a base;

affixing the electronic device to the base;

providing a cover, the cover having an aperture;

welding the cover to the base to form a housing;

degassing the assembly by heating to a temperature in the range of about 100-265° C for a time sufficient to remove at least some hydrogen from the housing;

providing a hydrogen diffusion port for the aperture, the hydrogen diffusion port sized to be received by the aperture; and

swaging the hydrogen diffusion port to the aperture to form a hermetically sealed swage fitting,

wherein the housing is characterized by an absence of plating applied to the base, the cover and each swage joint.

24. The method of claim 23 wherein the step of swaging the hydrogen diffusion port to the aperture includes the further steps of providing an intermediate material for insertion into each aperture, then swaging the hydrogen diffusion port into the intermediate material, and then soldering the intermediate material to the aperture to form a hermetically sealed solder joint, the housing further characterized by an absence of plating applied to the swage joint and the solder joint.

25. The method of claim 24 wherein the step of providing an intermediate material includes providing an intermediate material having substantially the same material composition as the cover.

26. The method of claim 23 wherein the step of providing a cover having the aperture includes providing a cover comprising aluminum.

27. The method of claim 23 wherein the step of providing a hydrogen diffusion port includes providing a hydrogen diffusion port selected from the group of materials consisting of palladium and palladium alloys, platinum and platinum alloys and titanium and titanium alloys.

28. A method for manufacturing a packaged electronic device comprising the steps of:

providing an electronic device;

providing a base;

affixing the electronic device to the base;

providing a cover comprising a titanium-based material having an inner surface and an outer surface; then

treating the inner and outer surfaces of the titanium–based cover to remove surface titanium oxides; then

immediately applying a protective coating to the treated surfaces of the cover to prevent the formation of titanium oxides;

then degassing the cover at a temperature in the range of about 375° F ± 25° for a time sufficient to remove hydrogen from the cover;

degassing the base by heating to a temperature in the range of about 100-265° C for a time sufficient to remove at least some hydrogen from the housing; and

welding the degassed cover to the degassed base to form a housing;

29. The method of claim 28 wherein the step of degassing the cover is performed for a time of about three hours.

30. The method of claim 28 wherein the cover comprising the titanium-based material is selected from the group consisting of commercially pure titanium, Ti 6Al-4V and Ti 3Al-2.5V.

31. The method of claim 28 wherein the step of includes coating the cover with a plating selected from the group consisting of Pd and Au up to a thickness of about 125 micro inches.